

REMARKS

The applicants thank the Examiner for the thorough examination of the application. The specification has been amended to correct minor errors. No new matter is believed to be added to the application by this amendment.

Status Of The Claims

Claims 1-19 are pending in the application. Support for the amendments to claim 1 can be found in paragraph 0011 at page 6 of the specification. Allowable Claims 9, 17 and 19 have been amended to stand as independent claims incorporating the subject matter of the base claim and any intervening claims. Claims 2, 4, 5, 8 and 10 have been amended to improve their language without reducing their scope.

Rejection Under 35 U.S.C. §103(a) Over Bergstrom

Claims 1-8 and 16 are rejected under 35 U.S.C. §103(a) as being obvious over the single reference of Bergstrom (U.S. Patent 5,468,829). Applicants respectfully traverse.

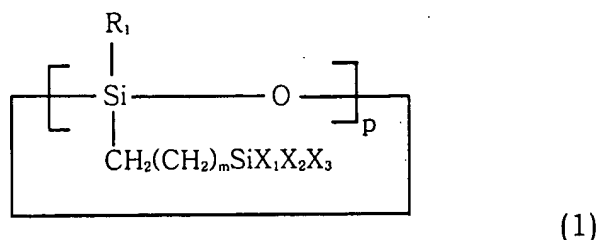
The Present Invention And Its Advantages

The present invention pertains to a low dielectric constant silane resin having a novel structure. An insulating film for a semiconductor device can be formed from the inventive low dielectric constant resin. Also, the inventive silane resins have excellent mechanical properties, heat stability and crack resistance

that make them useful materials for in insulating film between interconnect layers of a semiconductor device.

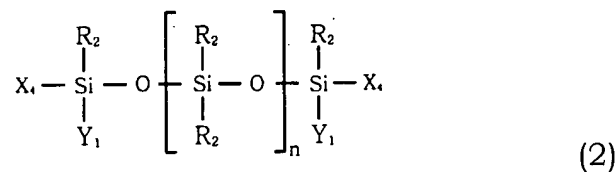
The invention finds a typical embodiment in instant claim 1:

1. A siloxane-based resin having a dielectric constant of 3.0 or less prepared by hydrolyzing and polycondensing a first monomer of the formula (1) and a second monomer of the formula (2) in an organic solvent in the presence of an acid or alkaline catalyst and water:



wherein,

R₁ is H, C₁₋₃ alkyl or C₆₋₁₅ aryl;
 each of X₁, X₂ and X₃, independently, is C₁₋₃ alkyl, C₁₋₁₀ alkoxy or halogen, provided that at least one of them is hydrolysable;
 m is an integer from 0 to 10; and
 p is an integer from 3 to 8; and

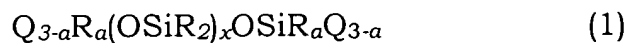


wherein,

R₂ is H, C₁₋₃ alkyl or C₆₋₁₅ aryl;
 X₄ is C₁₋₁₀ alkoxy;
 Y₁ is C₁₋₃ alkyl or C₁₋₁₀ alkoxy; and
 n is an integer from 0 to 10.

Distinctions Of The Invention Over Bergstrom

Bergstrom pertains to an *in-situ* reinforced silicone elastomer using a resin precursor. Bergstrom at column 2, line 66 discloses a monomer (1):



where x can be from 0 to 1000. Bergstrom at column 3, line 7 discloses a monomer (3):



where column 4, line 27 describes this formula as “hydrolysable cyclosiloxanes.”

Bergstrom fails to disclose or suggest a low dielectric constant (3.0 or less) silane resin suitable for use as a semiconductor insulating film. Indeed, Bergstrom fails to have any teaching or suggestion of a dielectric constant.

The *in-situ* reinforced elastomer of Bergstrom results from reacting a polydiorganosilane to produce an elastomer having a high tensile strength, typically above about 500 psi (3448 KPa). See Bergstrom at column 5, lines 25-27. However, Bergstrom’s elastomers are high strength elastomers that cannot be compared to the insulating film material of the invention. The teachings of Bergstrom thus have nothing to do with the siloxane-based resin of the present invention.

Also, the Examiner admits that Bergstrom uses a different catalyst system at page 2, lines 16-17 of the Office Action. However, it naturally follows that different catalysts will result in dissimilar polymeric materials having different properties. As a result, there is no basis to assume that that elastomer of Bergstrom would have a low dielectric constant, because the elastomer is prepared using a different process and catalyst. Further, although the Examiner discounts the different catalyst of the invention by its recitation in product-by-process format (Office Action at page 2, lines 18-25), MPEP 2113 makes clear that a resulting different structure has patentable weight:

The structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art, especially where the product can only be defined by the process steps by which the product is made, or where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product. See, e.g., *In re Garnero*, 412 F.2d 276, 279, 162 USPQ 221, 223 (CCPA 1979).

Additionally, claim 16 is directed to an interlayer insulating film for a semiconductor device that is made from the inventive low dielectric constant siloxane-based resin. Therefore, the interlayer insulating film has the unique characteristic of being prepared from a low dielectric constant siloxane resin that is fundamentally different from the elastomer of Bergstrom.

Further, at page 5, line 14 to page 6, line 1 of the Office Action, the Examiner asserts that the preamble of claim 6 gives no patentable weight to the claim. However, the interlayer insulating film for a semiconductor device recited in the preamble has weight, especially when considered in light of the body of the claim.

"[A] claim preamble has the import that the claim as a whole suggests for it." Bell Communications Research, Inc. v. Vitalink Communications Corp., 55 F.3d 615, 620, 34 USPQ2d 1816, 1820 (Fed. Cir. 1995). "If the claim preamble, when read in the context of the entire claim, recites limitations of the claim, or, if the claim preamble is 'necessary to give life, meaning, and vitality' to the claim, then the claim preamble should be construed as if in the balance of the claim." Pitney Bowes, Inc. v. Hewlett-Packard Co., 182 F.3d 1298, 1305, 51 USPQ2d 1161,

1165-66 (Fed. Cir. 1999). See also Jansen v. Rexall Sundown, Inc., 342 F.3d 1329, 1333, 68 USPQ2d 1154, 1158 (Fed. Cir. 2003). See MPEP 2111.02.

Yet further, the Examiner uses the single reference of Bergstrom to infer obviousness. To establish a *prima facie* case of obviousness, “the prior art reference (or references when combined) must teach or suggest all the claim limitations.” MPEP §2143. In addition, if a reference needs to be modified to achieve the claimed invention “there must be a showing of a suggestion or motivation to modify the teachings of that reference to the claimed invention in order to support the obviousness conclusion.” Sibia Neurosciences Inc. v. Cadus Pharmaceutical Corp., 225 F.3d 1349, 55 USPQ2d 1927 (Fed. Cir. 2000).

In the Office Action, the Examiner admits to Bergstrom’s failure to disclose a solvent (Office Action at page 3, lines 14-15), the amount of water (page 5, lines 1-3) and the curing time (page 5, lines 9-10). However, the Examiner fails provide discrete evidence of a motivation to modify Bergstrom other than to claim that the modification was within the abilities of one of ordinary skill or attainable through routine experimentation.

As a result, one having ordinary skill in the art would not be motivated by the teachings of Bergstrom to produce the invention set forth in claim 1. A *prima facie* case of obviousness has thus not been made. Claims depending on claim 1 are patentable for at least the above reasons.

Further, even if one assumes *arguendo* that Bergstrom is sufficient to allege *prima facie* obviousness, this obviousness would be fully rebutted by the

unexpected results of the invention. These results include the refractive index (Table 3), uniformity of refractive index (Table 3), uniformity of thickness (Table 3), dielectric constant (Table 4), Hardness (Table 5) and Modulus (Table 5). The advantages of the invention are thus clear.

This rejection is overcome and withdrawal thereof is respectfully requested.

Allowable Subject Matter

The Examiner has indicated that claims 9-15 and 17-19 contain allowable subject matter. Claims 9, 17 and 19 have been rewritten as independent claims, thus rendering these claims (and their dependent claims) instantly allowable.

Information Disclosure Statement

The Examiner is thanked for considering the Information Disclosure Statement filed December 31, 2003, and for making the initialed PTO-1449 form of record in the application in the Office Action mailed December 23, 2004.

Prior Art

The prior art cited but not utilized by the Examiner shows the status of the conventional art that the invention supercedes. Additional instructions are accordingly not necessary.

Conclusion

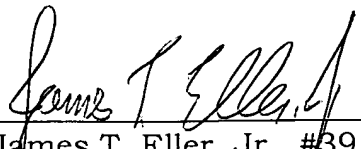
The rejection has been overcome. No issues remain. The Examiner is accordingly respectfully requested to place the application in condition for allowance and to issue a Notice of Allowability.

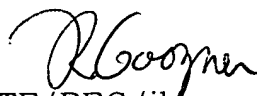
Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Robert E. Goozner, Ph.D. (Reg. No. 42,593) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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